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AFOEHL REPORT

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Wastewater Characterization Survey Little Rock AFB AR

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Final Report

AF Occupational and Environmental Health Laboratory
Human Systems Division (AFSC)
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19. ABSTRACT (Continue on reverse if necessary and identify by block number)

The AFOEHL conducted a wastewater characterization survey at Little Rock AFB from 11 to 24 Jul 88. The scope of the survey included characterizing the major sanitary discharges on base and determining whether the wastewater being discharged to the Jacksonville Wastewater Treatment plant violated limits for biochemical oxygen demand and total suspended solids. A total of 26 sampling sites were evaluated. Analytical results showed that discharge standards for biological oxygen demand and total suspended solids were not being exceeded by Little Rock AFB. [illegible]

Recommendations: (1) Cleaning of the grease traps at the dining facilities, i.e., the dining hall, NCO Club, and the O'Club, should be done routinely. (2) Sites 2, 4, 18, and 23 should be routinely sampled for biochemical oxygen demand and total suspended solids. (3) Sites 7, 14, 19, 20, 21, 25 and 26 should be routinely sampled for total suspended

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Item 19 Cont'd

solids and for the metals that exceeded Jacksonville sewer discharge ordinance at each site during the survey. (4) The feasibility of composting the wet garbage from the dining facilities should be explored as an alternative to sewer disposal. (6) Clean the separator located in front of the Air National Guard Corrosion Control Shop, bldg 207, routinely because of the large amount of oils and grease. (7) Low pH, high conductivity and high copper, lead and nickel concentrations indicate the presence of unneutralized battery acid being discharged into the sewer from the BX service station, Bldg 140. The base should verify that this practice is occurring on a routine basis, and take action to change disposal methods. (8) Sample Base Photo Lab regularly for silver to determine the silver recovery process efficiency.

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We also acknowledge Maj Allen Howard, OIC Bioenvironmental Engineering, and the staff of the Bioenvironmental Engineering Section, and Mr Bob Seay, the Environmental Coordinator, for the support given us during this survey. Thanks for making us feel welcome.

Contents

ILLUSTRATIONS

I. INTRODUCTION

On 5 May 1987, Little Rock AFB received a letter from the Jacksonville Wastewater Utility (JWWU), on the base's noncompliance with the wastewater discharge permit. JWWU informed the base that the wastewater from Little Rock AFB entering the city's west treatment plant had exceeded the limits of 250 mg/l for biochemical oxygen demand (BOD) and for total suspended solids (TSS). JWWU advised the base that surcharges for noncompliance may cost the base in excess of $40,000 per month, based on the additional loading.

Headquarters Military Airlift Command Bioenvironmental Engineering (HQ MAC/SGPB) requested AF Occupational and Environmental Health Laboratory, (AFOEHL/ECQ) perform a wastewater characterization survey at Little Rock AFB. (Appendix A) The objectives of the survey were to evaluate different branches (e.g., flight line, housing) of the sewer system and facilities contributing to the high BOD, TSS, and metal levels. The scope of this survey included the wastewater characterization at 20 sites along the sanitary sewer system, at a site exiting the base property, and at the influent to the wastewater treatment plant.

The wastewater characterization survey was conducted from 11 to 24 July 1988 by Lt Col Robert D. Binovi, 1Lt Charles W. Attebery, 1Lt Anthony T. Zimmer, 2Lt Shelia P. Scott, TSgt Benjamin Hernandez, SSgt Mary M. Fields, and Sgt Harold D. Casey. Maj Allen Howard, OIC Bioenvironmental Engineering, and Bob Seay, the Environmental Coordinator, were points of contact.

II. DISCUSSION

A. Background

Little Rock AFB, home of the 314th Tactical Airlift Wing (TAW), is located in the northeast corner of Pulaski County in Arkansas about 15 miles north of the Little Rock-North Little Rock Metropolitan area. This base is characterized by low, rolling hills, and wide, flat valleys. The workforce on base is approximately 5000 military and 930 civilians. Base residents total approximately 5000.

The 314 TAW mission is to organize, equip and train C-130 units for global tactical airlift operations. The 314 TAW operates the USAF school to train entry level C-130 aircrews for tactical airlift operations and to train C-130 pilots.

During this survey, the weather was hot, humid and rainy with maximum and minimum temperatures of 94° and 70° F, respectively. A total of 9.25 inches of rain fell during the survey.(1)

B. Sewer System

With the exception of some industrial shops having oil/water separators connected to the sanitary system, industrial and domestic wastewater typically discharges directly into the

sanitary sewer system. Except for lift stations serving the flight line, the western portion of family housing and the alert facility, sewage flows by gravity off-base to the 6.0 MGD Jacksonville treatment plant built in 1987. The plant effluent discharges into the Bayou Meto.

C. Wastewater Limitations

The wastewater is regulated by the City of Jacksonville Sewage Treatment Discharge Ordinance No. 620 and the provisions of the National Pretreatment Regulations (40 CFR, Part 403). Provisions in Ordinance No. 620 (Appendix B) and in the National Pretreatment Regulations prohibit the discharge of:

(1) Any liquid, solids or gases which may either alone or by interaction with other substances cause fire or explosion or be injurious in any other way to Public Owned Treatment Works (POTW) or to the operation of the POTW.

(2) Any water or waste that will solidify or become viscous.

(3) Wastewater with pH less than 5.0 and greater than 10.0.

(4) Wastewater containing toxic pollutants in sufficient quantity to injure or interfere with operations.

(5) Any harmful or odorous liquids, gases or solids which will prevent entry into the sewers for maintenance or repair.

(6) Wastewater that prevents POTW's effluent to be unsuitable for reclamation and reuse.

(7) Water containing substance to cause POTW to violate its National Pollution Discharge Elimination System (NPDES), or State Discharge Elimination System, or receiving water quality standards.

(8) Wastewater with objectionable color not removed in treatment process.

(9) Any wastewater having temperatures that exceeds 40°C (104°F) at the influent to the POTW.

(10) Any toxic radioisotopes without a special permit.

(11) Wastewater which causes a hazard to human life.

(12) Any wastewater which releases oxygen demanding pollutants (BOD) which will cause interference to the POTW. EXCEPTION: No longer than 15 minutes, more than 5 times the average 24 hour concentration, quantities or flows.

(13) Water or waste containing concentrations greater than:

Arsenic	50 µg/l
Cadmium	20 µg/l
Copper	20 µg/l
Cyanide	50 µg/l
Lead	100 µg/l
Mercury	5 µg/l
Nickel	800 µg/l
Silver	100 µg/l
Total chromium	500 µg/l
Zinc	500 µg/l

or other substances that will pass through the sewage treatment plant and exceed the state requirements for the receiving stream.

D. Procedures

1. Flow

a. Flow entering the Jacksonville Wastewater Treatment Plant from Little Rock AFB was measured by plant personnel. Flow measurements of the sanitary sewer system on base were performed with 8", 10" and 12" Palmer-Bowlus flumes by the AFOEHL survey team.

b. Water consumption was metered at the building 228 washrack for five days to estimate the loading to the sewer system from C-130 washing. A total of five C-130 aircraft were washed from 1530 Friday to 0800 Wednesday. A total of 20,600 gallons of water was used which is about 4,100 gallons per aircraft.

2. Sampling Site Numbers and Locations.

A list of sampling sites is included in Table 1. A diagram of the six main branches of the sanitary sewer system on base is shown in Figure 1. Approximate locations of sampling sites are shown in Figure 2. A typical sampling site with sampling equipment, the flight line lift station, is shown in Figure 3.

3. Sample Frequency

Four days of 24-hour equiproportional samples composited hourly were taken at sites 1-6. Twenty-four hour composite samples were also collected at 17 other sites. Two grab samples were taken because the composite samplers failed to collect sufficient samples. Composite and grab samples were collected with ISCO 2700 Automatic Wastewater Composite Samplers.

Table 1. Wastewater Sampling Site Locations

Site	Location
1	Bldg 270, Lift station, flight line
2	Manhole 25, Dining hall branch
3	Manhole 0-39, Wastewater exiting the base
4	Manhole 50, Officers Club, NCO Club, Razorback Inn branch
5	Manhole 404, Housing area branch
6	Jacksonville lift station flume, old plant
7	Bldg 228, Flight line washrack
8	Bldg 356, Propulsion
9	Bldg 222, Fuel Systems
10	Manhole 29, Recreation Center
11	Manhole 241, CE washrack
12	Manhole 268A, Nondestructive Inspection
13	Manhole 241, Transportation
14	Bldg 256, Aerospace Ground Equipment
15	Bldg 1080, NCO Club
16	Manhole 73, Officers Club
17	Bldg 864, Dining Hall
18	Manhole 86, Bowling Alley
19	Manhole 45, Auto Hobby Shop
20	Manhole 521, Hospital
21	Bldg 830, Base Photo Lab
22	Bldg 207, Air National Guard, Corrosion Control
23	Manhole 219, Fire Station and In-flight Kitchen
24	Bldg 390, Test Cell
25	Bldg 140, BX Snack Bar
26	Bldg 207, Corrosion Control oil/water separator

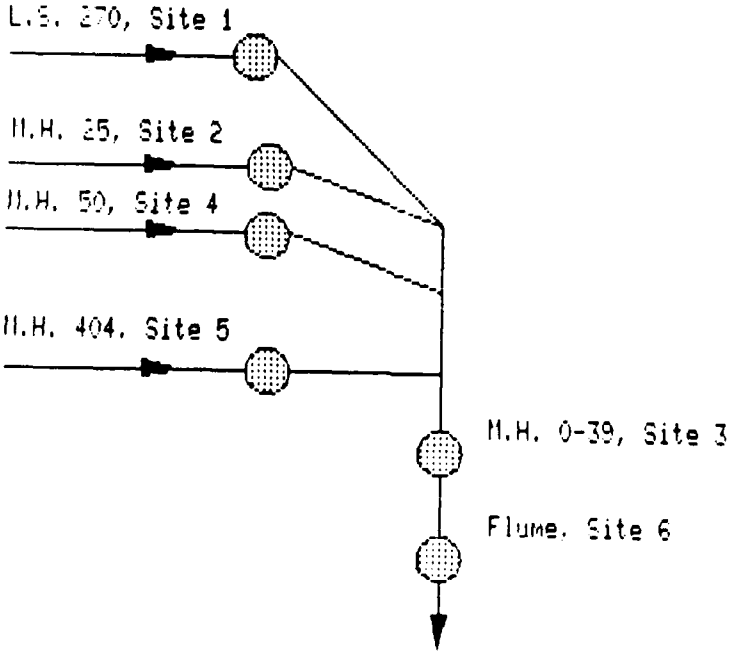

Figure 1: Sanitary Sewer Connections, LRAFB

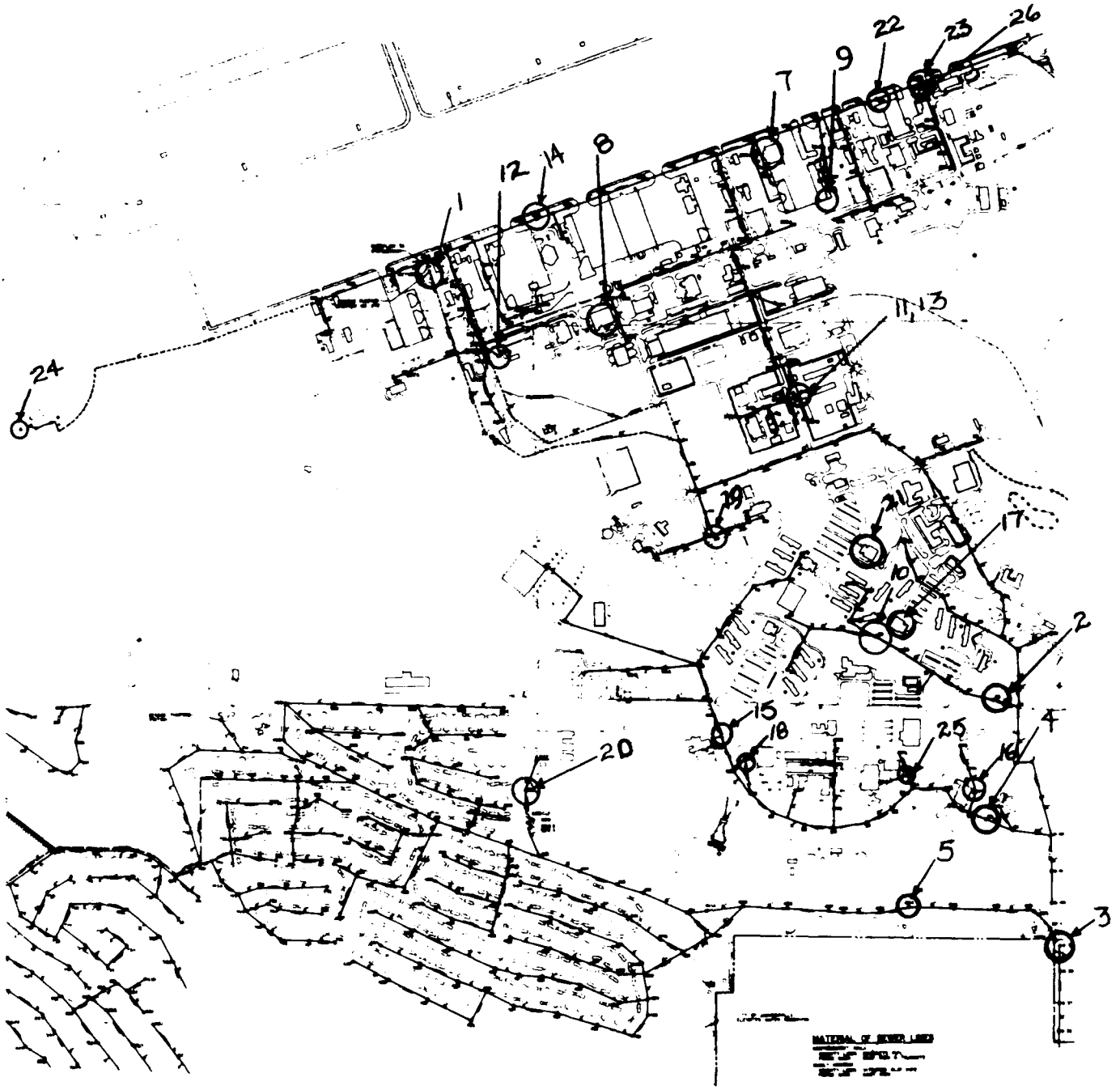

FIGURE 2: SAMPLING SITES

Figure 3: Flight Line Lift Station, Bldg 270

The strategy for determining the sampling sites and the parameters for analyses was based on the parameters listed in the permit. Sample frequency was based on evaluating the wastewater contribution to the main branches on base. Table 2 describes the sites, types, and frequency of the samples taken.

4. Sampling Analyses

The method of analysis and sample preservation for each parameter is listed in Table 3.

Table 2. Sample Type and Sampling Frequency

SITE	DESCRIPTION	TYPE	FREQUENCY
1	Bldg 270, Lift station	Hourly composite	4 day/24 hours
2	Manhole 25-Dining hall branch	Hourly composite	4 day/24 hours
3	Wastewater exiting base	Hourly composite	4 day/24 hours
4	Officers, NCO Clubs branch	Hourly composite	4 day/24 hours
5	Housing area branch	Hourly composite	4 day/24 hours
6	Jacksonville Lift Station	Hourly composite	4 day/24 hours
7	Flight line washrack, bldg 228	Hourly composite	1 day/24 hours
8	Propulsion, bldg 356	Hourly composite	1 day/24 hours
9	Fuel Systems, bldg 222	Hourly composite	1 day/24 hours
10	Recreation Center	Hourly composite	1 day/24 hours
11	CE Washrack	Hourly composite	1 day/24 hours
12	Nondestructive Inspection	Hourly composite	1 day/24 hours
13	Transportation	Hourly composite	1 day/24 hours
14	Aerospace Ground Equipment	Hourly composite	1 day/24 hours
15	NCO Club	Hourly composite	1 day/24 hours
16	O'Club	Hourly composite	1 day/24 hours
17	Dining Hall	Hourly composite	1 day/24 hours
18	Bowling Alley	Hourly composite	1 day/24 hours
19	Auto Hobby Shop	Hourly composite	1 day/24 hours
20	Hospital	Hourly composite	1 day/24 hours
21	Base Photo Lab	Hourly composite	1 day/24 hours
22	ANG Corrosion Control	Hourly composite	1 day/24 hours
23	Fire Station & In-flight Kitchen	Hourly composite	1 day/24 hours
24	Test Cell	Grab	1
25	BX Snack Bar	Hourly composite	1 day/24 hours
26	Corrosion Control separator	Grab	1

Table 3. Analysis and Sample Preservation Methods

PARAMETER	PRESERVATION	EPA METHOD(1)	WHERE	WHO
Chemical Oxygen Demand	None	Hach Mod. 410.4	on-site	AFOEHL
pH	None	A423	on-site	AFOEHL
Temperature	None	170.1	on-site	AFOEHL
Oils and Grease	H_2SO_4	418.1	Brooks AFB	AFOEHL
ICP Metals Screen	HNO_3	200.7	Brooks AFB	AFOEHL
As, Cd, Cr, Cu, Pb, Hg, Ni, Se, Zn, Ag, Be, Ti, Sn, Sb				
Mercury	HNO_3	245.1	Brooks AFB	AFOEHL
Biochemical Oxygen Demand (5-day)	None	405.1	on-site	AFOEHL
Total Suspended Solids	4 C	A209F	on-site	AFOEHL

A summary of sampling sites and corresponding analyses are included in Table 4.

Table 4. Site/Analysis Summary

Parameters	Site Number 1	2	3	4	5	6	7	8	9	10	11	12	13	14
Chemical Oxygen Demand	X	X	X	X	X	X	X	X	X	X	X	X	X	X
pH	X	X	X	X	X	X	X	X	X	X	X	X	X	X
Temperature	X	X	X	X	X	X	X	X	X	X	X	X	X	X
Biochemical Oxygen Demand	X	X	X	X	X	X	X	X	X	X	X	X	X	X
Oils and Grease														
Total Suspended Solids	X	X	X	X	X	X	X	X	X	X	X	X	X	X
ICP Metals	X	X	X	X	X	X	X	X	X	X	X	X	X	X
Mercury	X	X	X	X	X	X	X	X	X	X	X	X	X	X

Parameters	Site Number 15	16	17	18	19	20	21	22	23	24	25	26
Chemical Oxygen Demand	X	X	X	X	X	X	X	X	X	X	X	
pH	X	X	X	X	X	X	X	X	X	X	X	X
Temperature	X	X	X	X	X	X	X	X	X	X	X	X
Biochemical Oxygen Demand	X	X	X	X	X	X	X	X	X	X	X	
Oils and Grease	X	X	X		X				X		X	X
Total Suspended Solids	X	X	X	X	X	X	X	X	X			X
ICP Metals					X		X	X	X	X	X	X
Mercury					X		X	X	X	X	X	X

E. Wastewater Characterization Survey Results

1. Flow. Results of flow measurements are presented below.

Site Number	18 Jul 88 (MGD)	19 Jul 88 (MGD)
1	0.24	0.25
2	0.12	0.13
3	0.83	0.88
4	0.09	0.10
5	0.38	0.40
6	0.83	0.88

2. Analytical Results of Main Branches and Discharge to JWWP. Analytical results of physical and chemical parameters are given in this section to characterize the wastewater from the various branches and the wastewater discharging to the Jacksonville Wastewater Treatment Plant. The following is a description of each site and significant results:

a. Site 1. The samples were taken directly from the lift station, building 270, located off the flight line. Four days of COD averaged 133 mg/l and the BOD averaged 110 mg/l. These were characteristic of a domestic wastewater. The average TSS concentration was 59 mg/l.

b. Site 2. The samples were taken from the branch servicing the Main Dining Facility at manhole 25. The COD (1008 mg/l) and BOD (561 mg/l) were uncharacteristic of domestic sewage, reflecting the high organic loading from the food facility. The average TSS level was 288 mg/l.

c. Site 3. This sample site, representing the total wastewater leaving Little Rock AFB, was selected at manhole 0-39. The average of four days of COD and BOD results were 223 and 125 mg/l. The average TSS was 89 mg/l. This is characteristic of domestic wastewater.

d. Site 4. The sample taken from manhole 50 represented the Officers Club, NCO Club and the Razorback Inn facilities. The average COD (534 mg/l) and BOD (329 mg/l) showed the effects of organic loading from dining facilities on domestic wastewater. The average TSS was 276 mg/l.

e. Site 5. The sample from manhole 404 was representative of the housing area. The average COD (258 mg/l) and BOD (123 mg/l) concentrations were characteristic of domestic wastewater. The average TSS was 93 mg/l.

f. Site 6. This sample was taken directly from the flume before the wastewater entered the old treatment plant. The plant has been replaced, and a lift station constructed on site. The average COD (240 mg/l) and BOD (126 mg/l) were characteristic of domestic wastewater. The average TSS was 107 mg/l.

3. Analytical Results of Discharges from Base Facilities. Analytical results of physical and chemical parameters are given in this section to characterize the wastewater from the facilities on base. The following is a description of each site and significant results:

a. Site 7. The sample was taken from the effluent of the oil/water separator, servicing the flight line washrack. The COD was 720 mg/l and the BOD was 645 mg/l. The TSS was 81 mg/l. These concentrations reflect the industrial nature of the wastewater, containing detergents and oil. The cadmium (419 µg/l) and copper (292 µg/l) levels exceeded the permit's limits of 20 µg/l.

b. Site 8. The sample was taken from the manhole serving the Propulsion Shop. The BOD was 870 mg/l. The TSS was 1780 mg/l. The concentration of mercury (5.8 µg/l) exceeded the limit of the permit (5 µg/l).

c. Site 9. The sample was taken from the oil/water separator servicing building 222 from the fuel systems operations. The COD was 68 mg/l and the BOD was 30 mg/l. The TSS was 18 mg/l.

d. Site 10. The sample was taken from manhole 29 servicing the recreation center. The COD was 240 mg/l and BOD was 141 mg/l. The TSS was 87 mg/l. This is characteristic of domestic wastewater.

e. Site 11. The sample was taken from manhole 241 which connects the Civil Engineering washrack. The BOD was 120 mg/l. The TSS was 65 mg/l.

f. Site 12. The sample was taken from manhole 268A servicing the Nondestructive Inspection (NDI) Shop. The COD was 240 mg/l and BOD was 143 mg/l. The TSS was 31 mg/l. This is characteristic of domestic wastewater.

g. Site 13. The sample was taken from manhole 241 which connects Vehicle Maintenance. The BOD level was 238 mg/l. The TSS was 37 mg/l.

h. Site 14. The sample was taken from the manhole servicing the AGE Shop, building 256. The COD was 2160 mg/l and the BOD was 1001 mg/l. The TSS was 62 mg/l. The lead concentration (122 µg/l) exceeded the limit (100 µg/l) of the permit. This is characteristic of industrial wastewater and indicates corrosion control operations (e.g., painting, stripping) being performed. Note: At the time of sampling, personnel were washing the facility to clean the oils and greases from the cement. This was not standard operating procedure.

i. Site 15. The sample was taken from the NCO Club service connection clean-out. The COD was 5400 mg/l and the BOD was 1550 mg/l. The TSS was 454 mg/l. The concentration of oils and grease was 102.4 mg/l. These high concentrations reflect the organic loading from food preparation operations.

j. Site 16. The sample was taken from manhole 73 connecting the Officers Club. The COD and BOD levels were 1000 mg/l and 194 mg/l, respectively. The TSS was 526 mg/l. The concentration of oils and grease was 3.7 mg/l. These results indicate disposal of food wastes through the sewer system.

k. Site 17. The sample was taken from the Main Dining Facility grease trap discharge. The COD and the BOD levels were 1520 mg/l and 951 mg/l, respectively. The TSS was 470 mg/l. The concentration of oils and grease was 108.0 mg/l. Levels indicate the food serving nature of this operation.

l. Site 18. The sample was taken from manhole 86 connecting the bowling alley. The BOD level was 202 mg/l. The TSS was 312 mg/l. The results indicate domestic wastewater.

m. Site 19. The sample was taken from manhole 45 which services the Auto Hobby Shop. The BOD level was 970 mg/l. The TSS was 14 mg/l. The nickel (2130 µg/l) and lead (1670 µg/l) concentrations exceeded their 800 µg/l and 100 µg/l respective limits. Concentrations are indicative of painting operations at this location.

n. Site 20. The sample was taken at manhole 521, servicing the hospital. The COD and the BOD levels were 44 mg/l and 96 mg/l, respectively. The TSS was 57 mg/l. The nickel level (2130 µg/l) exceeded the limit (800 µg/l) of the permit. The high level of nickel indicates that corrosion of the pipe could be occurring. This is probably due to the pH (6.06) of the water from the processes within the hospital. Typical wastewater discharge has a pH between 6.7 and 8.1.

o. Site 21. The sample was taken from manhole 43 servicing the Base Photo Lab. The COD and the BOD levels were 740 mg/l and 85 mg/l, respectively. The TSS was 30 mg/l. The silver (332 µg/l) concentration level exceeded the permit level (100 µg/l). Silver discharge is indicative of the disposal of photographic processing wastewater into the sewer system.

p. Site 22. The sample was taken from manhole 214 connecting the Air National Guard Corrosion Control shop. The COD and the BOD levels were 650 mg/l and 120 mg/l, respectively. The TSS was 82 mg/l.

q. Site 23. The sample was taken from manhole 219 which drains the Fire Station and the In-flight Kitchen. The COD and the BOD levels were 2320 mg/l and 114 mg/l, respectively. The TSS was 248 mg/l. The concentration of oil and grease was 134.4 mg/l. Levels indicate wastewater containing food processing or industrial chemicals used at the fire station, such as Aqueous Film Forming Foam (AFFF).

r. Site 24. The grab sample was taken from the Jet Engine Test Cell oil/water separator discharge. The COD and the BOD levels were 550 mg/l and 235 mg/l, respectively. The concentration of oil and grease was 216.0 mg/l.

s. Site 25. The sample was taken from manhole 90 which services the BX snack bar. The COD and BOD levels were 800 mg/l and 90 mg/l, respectively. The concentration of oil and grease was 56.0 mg/l. These metals were exceeded: copper (1030 µg/l), lead (501 µg/l) and nickel (1490 µg/l). The limits are 20 µg/l, 100 µg/l and 800 µg/l, respectively. The pH (2.21) of the water was below the limits of the permit (5.0). The conductivity was 4800 µmhos. Evidently the BX service station is draining batteries into the sewer system.

t. Site 26. The sample was taken directly from the Air National Guard Corrosion Control Shop oil/water separator. The TSS was 82 mg/l. The concentration of lead (216 µg/l) exceeded the limit of the permit (100 µg/l). This is indicative of lead-based primers used on aircraft.

4. BOD, COD, and TSS Loading and the BOD to COD Ratio

a. Biochemical Oxygen Demand

Table 5 summarizes the results of the BOD testing and the loading to the plant for four consecutive days from 12 through 15 July 1988. All the quality control checks in Method A405.1(2) were met. Flow data from 19 July 1988 was used for the calculations. A summary of all the results, even when the glutamic acid quality control results were not in the required range, are included in Appendix C. Appendix D includes the pH, temperature and conductivity results.

Table 5. BOD_5 Loading, Sewage Treatment Plant

SITE	AVG BOD mg/l	FLOW (MGD)	LOADING (LBS /Day)	%TOTAL
1	110	0.25	229	15
2	561	0.13	608	40
3	125	0.88		
4	329	0.10	274	18
5	123	0.40	410	27
6	126	0.88		

b. Chemical Oxygen Demand

The summary of results of the four-day COD sampling are presented in Table 6.

Table 6. COD Results and Plant Loading

SITE	COD (avg) (mg/l)	FLOW (MGD)	LOADING (LBS/Day)	%TOTAL
1	133	0.25	277	11
2	1008	0.13	1093	41
3	223	0.88		
4	534	0.10	445	17
5	258	0.40	858	32
6	240	0.88		

c. COD/BOD Ratios

An indication of the industrial nature of wastewater can be obtained by calculating a BOD/COD ratio. The ratio of the BOD to COD ranges in values between 0.0 and 1.0, but is normally substantially less than 1.0. A ratio of 0.5 or greater is obtained for most natural organics (including domestic sewage) and indicates high biodegradability. Man-made organics not normally found in nature (including chlorinated organics) are not as biodegradable, and their presence in a water sample decreases the BOD/COD ratio. Industrial wastewater typically has a BOD/COD ratio in the .35 range or less. Results are presented in Table 7.

The BOD to COD ratio is commonly used to evaluate the industrial nature of a wastewater. A low value (less than 0.5) indicates sewage of an industrial nature. The analysis of the data in Table 5 indicates the wastewater entering the Jacksonville Wastewater plant from Little Rock AFB, is domestic in nature.

d. Total Suspended Solids

Table 7 is presented to indicate the industrial or domestic nature and organic loading of the wastewater for the main branches.

TABLE 7. COD/BOD RATIO

Site	Flow	%Flow	COD	%COD	BOD	%BOD	BOD/COD	TSS	%TSS
1	0.25	28	133	11	110	15	0.83	59	12
2	0.13	15	1008	41	561	40	0.56	288	32
3	0.88	100	223	----	125	----	0.56	89	----
4	0.10	12	534	17	329	18	0.62	276	24
5	0.40	45	258	32	123	27	0.48	93	32
6	0.88	100	240	----	126	----	0.53	107	----

From Table 7 it can be concluded that the Base effluent is domestic in nature with BOD and TSS within permit limitations.

III. CONCLUSIONS

A. *The base was having problems meeting BOD and TSS limits from the City of* Jacksonville prior to the survey. The major sources of high concentrations of BOD and TSS were found to be the food servicing facilities, specifically the main dining facility. At about the time of the survey, flow was diverted to a new lift station before entering the new plant. Also, during and after the survey, the base was found to meet its effluent limits. It can be concluded that the old lift station where sampling was being performed was accumulating solids and grease and that samples were not representative of the effluent from the base.

B. Sites 2, 4, 18, and 23 on the average would have exceeded the Jacksonville Wastewater Treatment Plant permit standards if the discharge would have gone directly into the plant. These sites represent the dining facilities where high BOD and/or TSS were found. Sites 2 and 4 contribute approximately 58% of the total BOD from the base.

C. The solids and grease contributing to the high BOD and TSS concentrations are passing through dining facility grease traps either because of an inadequate frequency of servicing, hydraulic overloading, or noncollectible solids passing through the traps. The base did not have a contract to collect wet garbage, and consequently waste foodstuff was being ground up in garbage disposal units and discharged into the sewer system.

If the base again fails to meet effluent limitations for BOD and TSS, controls to prevent this type of discharge should be enacted. Wet garbage (foodstuff only, no paper) can be collected and disposed of in sanitary landfills or composted to provide rich garden soil. Under suitable conditions, garbage can be converted to composting material in as little as 30 days.

Composting is the biochemical process where organisms break down the available biodegradable organics into simpler, more stable compounds and carbon dioxide. The organisms self-generate heat. The available organisms that compost organics operate in the same mesophilic and thermophilic temperature ranges as anaerobic digestion.

Composting may occur with either aerobic or anaerobic organisms. The normal practice is to use aerobic composting. Aerobic composting is more rapid and reaches high temperatures (therefore tends to sterilize the end product better). The composting of sewage sludge for sale as humus can be used by landscapers, nurseries and parks.(5)

D. The Jacksonville Sewage Treatment Plant is an activated sludge process consisting of bar screen and grit chamber, an aeration basin, secondary clarification, sand and filtration. As a back-up unit, to remove oil, the plant has a dissolved air flotation unit which was not in operation. The plant has no trouble meeting limitations for standard parameters measuring domestic wastewater strength (BOD, TSS). The design of the plant makes it susceptible to upset by BOD overloading. The base personnel should be aware that major discharges of certain chemicals may cause problems. High BOD containing materials, such as AFFF may cause anaerobic conditions in the aeration basins and excessive foaming. Refractory organics, such as trichloroethane will pass through untreated, and oil or fuel may cause explosive or expensive cleanup problems.

E. Low pH and high concentrations of copper, lead and nickel at Manhole 90 (BX Snack Bar) is indicative of battery acid being discharged. The BX Service Station is a possible source of battery acid. Battery acid should at least be neutralized and tested prior to disposal in the sewer system. Sampling should be performed at least four different times. The samples should be analyzed for hazardous waste characteristics, 40 CFR 261, using test methods outlined in EPA Publication SW-846.

F. High metals concentrations at sites 7, 14, 19, 20, 25 and 26 appear to be coming from the washing of vehicles (strippers) and the corroding of pipes.

G. Site 21 analyses imply that the photo processing silver recovery unit is not operating efficiently. Silver is a by-product of photoprocessing, being contained on the film. It enters the wastewater in the developing process. Silver recovery units can effectively capture most of the silver in the wastewater. High silver concentrations at the Base Photo Lab indicate that the silver recovery process is not working efficiently, and most probably requires servicing.

IV. RECOMMENDATIONS

A. Cleaning of the grease traps at the dining facilities such as the dining hall, NCO club, In-flight kitchen and the O'Club should be done routinely. Sample these sites routinely for BOD and TSS.

B. Some of the concentrations of metals from the specific shops suggest potential sources for exceeding the limits of the permit if the process is not modified. High metals were found at sites 7, 14, 19, 20, 21, 25, and 26. Sample these sites routinely for metal(s) that may exceed pretreatment limitations.

C. A comprehensive hazardous waste survey should be performed to determine specifically what is discharged into the sewer system. AFOEHL can provide this type of survey by request.

D. Composting the wet garbage from the dining facilities should be an alternate disposal option to hiring a contractor.

E. Service the oil/water separator located in front of the Air National Guard Corrosion Control Shop, Bldg 207.

F. The low pH and high conductivity with high concentrations of copper, lead and nickel indicate that unneutralized battery acid is being drained into the sanitary sewer system from sampling performed at manhole 90. The base should determine if unneutralized battery acid is disposed through the sewer from the BX Service Station. If so, the base should take action to establish procedures for acid neutralization, or better still, develop procedures for the turn-in and reclaiming of wet batteries.

G. The Propulsion Shop showed high concentrations of mercury with extremely high TSS. Further investigation by the BEE Shop is necessary to identify the operation and the causes for high concentrations of mercury and TSS. Also, sample regularly for mercury and TSS from this shop.

H. Discharge from the Base Photo Lab exceeded the ordinance for silver. Dilution lowered the concentration of silver below the sewer ordinance limitation of 100 µg/L in samples taken at a point where the combined sewage left the base. Sample for silver routinely to examine the silver recovery process efficiency.

REFERENCES

1. Telephone conversation between Lt Scott, USAFOEHL/ECQ, and the weather squadron and Public Affairs, Little Rock AFB, 17 Aug 88.

2. APHA, Standard Methods for the Examination of Water and Wastewater, 16th ed., American Public Health Association, Washington DC, 1985.

3. City of Jacksonville Ordinance No. 620, January 10, 1986.

4. USEPA, Methods for Chemical Analysis of Water and Wastes, EPA 600/4-79-020, Cincinnati OH (1983).

5. Wiley, Unit Processes of Sanitary Engineering, Linvil G. Rich, 1963.

6. Code of Federal Regulations, 40, Part 403, July 1, 1987.

7. "Test Methods for Evaluating Solid Waste, Physical/Chemical Methods," EPA Publication SW-846, Second Edition, 1982.

APPENDIX A

Request Letter

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DEPARTMENT OF THE AIR FORCE
USAF Hospital Little Rock (MAC)
Little Rock Air Force Base AR 72099-5300

FROM: SG 27 Jan 88

SUBJECT: Wastewater Characterization Study

TO: HQ MAC/SGPB 10 Feb 88
USAF OEHL/CC
IN TURN

1. Currently Little Rock AFB is involved in a disagreement with the city of Jacksonville, AR, over wastewater treatment surcharges exceeding $40,000. The city has alleged base effluents have exceeded limits for biochemical oxygen demand (BOD) and total suspended solids (TSS) periodically since April 1987. Data of sampling accomplished by a 314 CES/DEEV contractor do not agree. We request your support to accomplish a wastewater characterization study of the base to quantity strength of base effluents and to determine the probable cause of variation between the base and city sampling data. Request the study be accomplished in the June-July 1988 time frame.

2. The study should include evaluation of the contribution of different zones of the base (i.e., flightline, housing, etc) to the overall wastewater characteristics and assesment of the contribution of specific shops of priority pollutants defined in 40 CFR 401.15 to the base effluents. No local analytical capability should be assumed.

3. This problem has been discussed with Lt Col Sweigart and Lt Col Binovi in December 1987 and January 1988 with Maj Howard, our bioenvironmental engineer. A package of information including city and base sampling data, city ordinances, and correspondence between the base and city was forwarded by Maj Howard and Mr Windsor (314 CES/DEEV) in December 1987 for Lt Col Binovi's review and suggested plan of action for us.

4. Our POCs are Maj Howard/SGPB, AV 731-7398/7388 and Mr Malcolm Windsor/314 CES/DEEV, AV 731-6434.

EARL W. FERGUSON, Col, USAF, MC
Commander

cc: 314 CSG/CD
314 CES/DEEV

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APPENDIX B

City of Jacksonville Permit

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DEPARTMENT OF THE AIR FORCE

HEADQUARTERS 314 TACTICAL AIRLIFT WING (MAC)
LITTLE ROCK AIR FORCE BASE, ARKANSAS 72076

24 NOV 1981

REPLY TO
ATTN OF: LGC (LGCC, MS. Eichbrecht, 501/988-3379)

SUBJECT: Industrial Discharge Permit, City of Jacksonville, Contract F03602-76-D0081

City of Jacksonville
Attn: Mr. Dick Morris
109 Second St.
Jacksonville, AR 72076

1. In order to comply with EPA regulations and Ordinance #620 of the City of Jacksonville, it is necessary to have the City of Jacksonville recognize Little Rock Air Force Base as being in a Unique Classification of a User of the sewage facilities, and assure that Little Rock Air Force Base is given sufficient notification of any disruption of sewage services. Therefore, the following statement is proposed to clarify the Government's position.

a. Little Rock Air Force Base (hereinafter referred to as "the Base") has been categorized as an industrial user of the Jacksonville Wastewater Utility ("the Utility"). Both the Base and the Utility recognize that only approximately two per cent (2%) of the wastewater discharge from the Base is industrial in nature. The remaining ninety-eight per cent (98%) of the wastewater discharge is residential or other non-industrial portion of the Base (the two per cent) is generally confined to the flightline areas of the Base, areas of the wastewater discharge system which can be selectively isolated (physically disconnected) by civil engineers on the Base.

b. Since there are 1535 family housing units on the Base, any termination of wastewater treatment services would severly affect the health of those Base residents. Accordingly, the Base and the Utility recognize that reasonable notice by the Utility to the Base is both desirable and necessary.

c. Understanding the above, the Base and the Utility, with the concurrence of the City of Jacksonville, the Jacksonville Sewer Commission and the Jacksonville Wastewater Utility agree that the Base will be given time to isolate any areas suspected of contributing substances prohibited or not covered by the Industrial Discharge Permit. Reasonable time for isolating and shutting off suspected areas is defined as four (4) hours during Base Workdays and six (6) hours during other periods. The parties understand and agree that the point of contact on the Base is the 24-hour Civil Engineering Services Desk, telephone numbers 988-6159 or 988-6553.

Attch 4

d. Please indicate agreement below with the signatures of the individual(s) authorized to sign contracts of this nature for the City of Jacksonville, the Jacksonville Wastewater Utility and the Jacksonville Sewer Commission. Return the original and one copy of this letter to the Base Contracting Division; and a signed, completed copy will be forwarded to you for your file.

LITTLE ROCK AIR FORCE BASE

Betty J. Bone — 12-2-81

BETTY J. BONE, BASE CONTRACTING OFFICER — DATE

JACKSONVILLE SEWAGE COMMISSION

B.J. Boroughs — 12-1-81

B.J. BOROUGHS, CHAIRMAN/COMMISSIONER — DATE

2. If you are in agreement with the statement above, please have Mr. Boroughs sign where indicated and return to this office. A modification incorporating the Ordinance #620 as amended by this letter, and said letter, will be issued. You will be provided fully signed copies of both documents for your files.

Betty J. Bone

BETTY J. BONE
Base Contracting Officer

SOC. SEC. (41 CFR) 1-16.101

AMENDMENT/MODIFICATION NO.	2. EFFECTIVE DATE	3. REQUISITION/PURCHASE REQUEST NO.	4. PROJECT NO. (If applicable)
008	29 MAR 82	FQ4460127400O7	

5. ISSUED BY CODE	6. ADMINISTERED BY (If other than block 5) CODE
e Contracting Division TAW LGCC, Bldg 642, LRAFB ksonville AR 72099 CC, Ms. Eichbrecht, 501/988-3378)	

7. CONTRACTOR CODE 3SC3N FACILITY CODE	8.
City of Jacksonville 109 Second Street Jacksonville, AR 72099	☐ AMENDMENT OF SOLICITATION NO. _____ DATED _____ (See block 9) X ☐ MODIFICATION OF CONTRACT/ORDER NO. F03602-76-00081 DATED 23 NOV 60 (See block 11)

THIS BLOCK APPLIES ONLY TO AMENDMENTS OF SOLICITATIONS

☐ The above numbered solicitation is amended as set forth in block 12. The hour and date specified for receipt of Offers ☐ is extended, ☐ is not extended.

Offerors must acknowledge receipt of this amendment prior to the hour and date specified in the solicitation, or as amended, by one of the following methods:

) By signing and returning _____ copies of this amendment; (b) By acknowledging receipt of this amendment on each copy of the offer submitted; or (c) By separate letter or telegram which includes a reference to the solicitation and amendment numbers. FAILURE OF YOUR ACKNOWLEDGMENT TO BE RECEIVED AT THE ISSUING OFFICE PRIOR TO THE HOUR AND ATE SPECIFIED MAY RESULT IN REJECTION OF YOUR OFFER. If, by virtue of this amendment you desire to change an offer already submitted, such change may be made by telegram r letter, provided such telegram or letter makes reference to the solicitation and this amendment, and is received prior to the opening hour and date specified.

ACCOUNTING AND APPROPRIATION DATA (If required)

'A

THIS BLOCK APPLIES ONLY TO MODIFICATIONS OF CONTRACTS/ORDERS

(a) ☐ This Change Order is issued pursuant to _____

The Changes set forth in block 12 are made to the above numbered contract/order.

(b) ☐ The above numbered contract/order is modified to reflect the administrative changes (such as changes in paying office, appropriation data, etc.) set forth in block 12.

(c) [X] This Supplemental Agreement is entered into pursuant to authority of Mutual Agreement of Contracting Parties.

It modifies the above numbered contract as set forth in block 12.

DESCRIPTION OF AMENDMENT/MODIFICATION

HEREAS, the City of Jacksonville (hereafter to be referred to as "City") has passed Ordinanc 620, dated 20 Nov 1980, in order to comply with all applicable State and Federal laws requir y the Federal Water Pollution Control Act (hereafter to be referred to as the "Act"), also nown as the Clean Water Act of 1977, as amended, 33 U.S.C. 1251, et seq., and the General reatment Regulations, 40 CFR, Part 403 and

WHEREAS, the Act is being administered by the Environmental Protection Agency (EPA), and

WHEREAS, the City is obliged to obey and enforce the Act, and desires to issue permits to its Jsers in order to control conditions under said Act, and

WHEREAS, the City has recognized, in writing, Little Rock Air Force Base as being in a unique classification of user (98% residential and 2% industrial), and

WHEREAS, the City has agreed to, in writing, to give Little Rock Air Force Base reasonable time, after notification, in which to correct any suspect areas in violation of said Act,

Except as provided herein, all terms and conditions of the document referenced in block 8, as heretofore changed, remain unchanged and in full force and effect.

13. ☐ CONTRACTOR/OFFEROR IS NOT REQUIRED TO SIGN THIS DOCUMENT [X] CONTRACTOR/OFFEROR IS REQUIRED TO SIGN THIS DOCUMENT AND RETURN ORIG + 2 COPIES TO ISSUING OFFICE

14. NAME OF CONTRACTOR/OFFEROR	17. UNITED STATES OF AMERICA
BY Clyde W. Baker (Signature of person authorized to sign)	BY Katherine Loseberry (Signature of Contracting Officer)

15. NAME AND TITLE OF SIGNER (Type or print)	16. DATE SIGNED	18. NAME OF CONTRACTING OFFICER (Type or print)	19. DATE SIGNED
Chairman, Jacksonville Sewer Commission	6-3-82	KATHERINE L. ROSEBERRY	82 Jun 1

ITEM NO.	SUPPLIES/SERVICES	QUANTITY	UNIT	UNIT PRICE	AMOUNT

NOW THEREFORE, The parties hereto, in conformance with the terms and conditions of ontract number F03602-76-D0081, dated 23 November 1960, as amended, agree as follows:

1. Ordinance #620, dated 20 November 1980, the letter of agreement between Little Rock ir Force Base and the City, dated 24 November 1981, signed by Mrs. Betty J. Bone, Base ontracting Officer, and Mr. B. J. Boroughs, Chairman/Commissioner of the Jacksonville Sewer ommission, and the Application for Industrial Discharge Permit are hereby incorporated into ontract Number F03602-76-D0081.

2. The City agrees that wherein there should lie conflicting provisions, said Contract akes precedence over any provisions of City Ordinance #620 and the Application for Industrial Discharge Permit. Any conflicting provisions shall also be resolved to meet the requirements of Federal and State law.

3. Each party agrees that it shall respect and preserve the rights of the other in accordance with provisions of said Contract.

4. No revisions or amendments to City Ordinance #620 are provided for under this modification, but such changes and further revisions shall not be binding upon the Government, unless (1) 60 days' notification is given to the Government, in writing; (2) agreed to by the Government after review, consideration and determination; and (3) reduced in writing and signed by both parties.

U.S. GOVERNMENT PRINTING OFFICE 1978 256-630

Buercklin

DEEV (Buercklin, 6435) 16 JUN 1981

Industrial Discharge Permit, Contract No. F03602-76-D0081

314 TAW/LGC

1. The following information is provided to allow modification of the contract to incorporate the provisions of the Industrial Discharge Permit.

2. A set of base sewer plans is attached as requested in the first paragraph of the application. There are no proposed projects that would have a bearing on the industrial discharge per paragraph 2 of the application.

3. A schedule of all processed water per paragraph 3 of the application follows:

a. Aircraft washrack: Maximum rate of discharge is 20-30 gpm. The daily volume of wash water including rinse is 6600 gallons. The daily volume of soap is 15 gallons. The soap is MIL-C-25769J, which is an alkaline, water base, no phosphate, biodegradable and noncorrosive. Discharge is through an oil/water separator before entering the sanitary sewer system.

b. Base Photo Lab: The daily volume is 4 gallons, which is trickled into the sewer over a 24 hour period after passing through a silver reclaimer. The products used are developer (Kodak DK-50, color processor (Kodak D-6), dektol developer and fixer(Hunt Chemical Corp.).

c. Hospital x-ray development: The daily volume is 2 gallons which is trickled into the sewer over a 24 hour period.after passing theough a silver reclaimer. The products used are:developer (Kodak RP X-OMAT and fixer (Kodak RP X-OMAT).

4. A copy of the 314 TAW/JA reply that was requested on 6 May 1981 will be provided upon receipt. Preliminary verbal coordination with JA and HQ MAC/DEMU indicates the base will have to comply with the ordinance.

SIGNED

CHARLES B. BENSON, PE
Chief, Environmental and
Contract Planning Section

1 Atch
Base Sanitary Sewer Plans

Buercklin:jes 16 Jun 81

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APPENDIX C

Physical Parameter and Inorganic
Analysis Results

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PHYSICAL PARAMETER AND INORGANIC ANALYSES RESULTS

Site		1 (avg)	2 (avg)	3 (avg)	4 (avg)	5 (avg)	6 (avg)	7	8	9
Parameter	units									
COD	mg/l	133	1008	223	534	258	240	720	146*	68
BOD	"	110	561	125	329	123	126	645	870	30
TSS	"	59	288	89	276	93	107	81	1780	18
O & G	"									
Arsenic	µg/l	<100	<100	<100	<100	<100	<100	<100	<100	<100
Cadmium	µg/l	<100	<100	<100	<100	<100	<100	419	175	<100
Chromium	"	<100	<100	<100	<100	<100	<100	<100	<100	<100
Copper	"	<100	<100	<100	<100	<100	<100	292	<100	<100
Lead	"	<20	<20	<20	<20	<20	<20	47	55	53
Mercury	"	<1	<1	<1	<1	1.3	<1	<1	5.8	<100
Nickel	"	287	234	251	139	200	295	428	237	<100
Silver	"	<10	<10	<10	<10	<10	<10	11	<10	<100
Beryllium	"	<100	<100	<100	<100	<100	<100	<100	<100	<100
Zinc	"	124	120	104	266	<100	<100	294	965	267

Site		10	11	12	13	14	15	16	17	18	19
Parameter	units										
COD	mg/l	240	25*	240	100*	2160	5400	1000	1520	170*	202*
BOD	"	141	120	143	238	1001	1550	194	951	202	970
TSS	"	87	65	31	37	62	454	526	470	312	14
O & G	"							102	4	108	29
Arsenic	µg/l	<100	<100	<100	<100	<100					<100
Cadmium	"	<100	<100	<100	<100	<100					<100
Chromium	"	<100	<100	<100	<100	<100					283
Copper	"	<100	<100	<100	<100	<100					<100
Lead	"	<20	<20	47	45	122					1670
Mercury	"	<1	<1	<1	<1	<1					2
Nickel	"	193	218	129	530	447					2129
Silver	"	<10	<10	10	<10	<10					<10
Beryllium	"	<100	<100	<100	<100	<100					<100
Zinc	"	152	<100	436	<100	897					205

* Note: These results are questionable because COD is less than BOD. The sampler may have accumulated a large amount of solids.

PHYSICAL PARAMETER AND INORGANIC ANALYSES RESULTS CONT'D

Site Parameter	units	20	21	22	23	24	25	26
COD	mg/l	44	740	650	2320	550	800	
BOD	"	96	85	120	114	235	90	
TSS	"	57	30	92	248		820	82
O & G	"				134	216	56	
Arsenic	µg/l		<100	<100	<100	<100	<100	<100
Cadmium	"		<100	<100	<100	<100	<100	141
Chromium	"		<100	<100	<100	<100	2820	<100
Copper	"		<100	<100	<100	<100	1030	298
Lead	"		<20	<20	57	<20	501	216
Mercury	"		1.1	<1	<1	<1	<1	<1
Nickel	"		<100	<100	158	213	1490	159
Silver	"		332	<10	10	<10	<10	<10
Beryllium	"		<100	<100	<100	<100	<100	<100
Zinc	"		298	122	365	151	4758	949

APPENDIX D

Temperature, Ph, and
Conductivity Results

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TEMPERATURE, pH, AND CONDUCTIVITY RESULTS

Site	Date	Temp (C)	pH	Conductivity (µmhos)
1	13 JUL 88	17	6.16	300
1	14 JUL 88	22	6.24	300
1	15 JUL 88	24	6.31	320
1	16 JUL 88	22	6.03	320
2	13 JUL 88	17	5.96	250
2	14 JUL 88	22	6.12	280
2	15 JUL 88	24	6.01	430
2	16 JUL 88	24	5.32	350
3	13 JUL 88	25	6.31	260
3	14 JUL 88	23	6.35	280
3	15 JUL 88	24	6.20	400
3	16 JUL 88	25	6.18	300
4	13 JUL 88	23	6.52	350
4	14 JUL 88	22	6.68	300
4	15 JUL 88	19	6.56	380
4	16 JUL 88	23	6.36	320
5	13 JUL 88	26	6.16	300
5	14 JUL 88	23	6.41	300
5	15 JUL 88	23	6.32	350
5	16 JUL 88	22	6.44	300
6	14 JUL 88	21	6.16	180
6	15 JUL 88	22	6.30	320
6	16 JUL 88	25	6.17	300
7	13 JUL 88	23	7.40	290
8	14 JUL 88	25	6.61	1250
9	13 JUL 88	26	5.70	60
10	14 JUL 88	25	5.61	300
11	15 JUL 88	23	6.16	320
12	15 JUL 88	23	6.24	300
13	16 JUL 88	20	5.71	320
14	15 JUL 88	25	6.86	400
15	16 JUL 88	24	6.02	400
16	16 JUL 88	24	7.04	320
17	16 JUL 88	24	5.64	350

TEMPERATURE, pH, AND CONDUCTIVITY RESULTS (Cont'd)

Site	Date	Temp (C)	pH	Conductivity (µmhos)
18	17 JUL 88	22	6.28	330
19	17 JUL 88	24	5.84	190
20	17 JUL 88	23	6.06	120
21	18 JUL 88	24	6.39	350
22	18 JUL 88	25	7.20	500
23	18 JUL 88	24	6.31	400
24	18 JUL 88	25	5.33	
25	18 JUL 88	26	2.21	4800
26	18 JUL 88	25	5.45	460

Distribution List

	Copies
HQ USAF/SGPA Bolling AFB DC 20332-6188	1
HQ AFSC/SGPB Andrews AFB DC 20334-5000	1
AAMRL/TH Wright-Patterson AFB OH 45433-6573	1
HQ MAC/DEEV Scott AFB IL 62221-5001	1
USAF Regional Medical Center Weisbaden/SGB APO New York 09220-5300	1
OL AD, AFOEHL APO San Francisco 96274-5000	1
USAFSAM/TSK Brooks AFB TX 78235-5301	1
Defense Technical Information Center (DTIC) Cameron Station Alexandria VA 22304-6145	2
HQ USAF/LEEV Bolling AFB DC 20330-5000	1
HQ AFESC/RDV Tyndall AFB FL 32403-6001	1
USAF Hospital Little Rock/SGPB Little Rock AFB AR 72099-5300	3
314 CES/DEEV Little Rock AFB AR 72099-5000	3
HQ HSD/XAE Brooks AFB TX 78235-5000	1
USAFSAM/EDH Brooks AFB TX 78235-5301	1
HQ MAC/SGPB Scott AFB IL 62221-5001	1

☆ U.S. GOVERNMENT PRINTING OFFICE: 1989—661-041/00036